

Evaluation of Unmanned Aircraft Systems (UAS) Observing Strategies Suitable for Transition into Routine NOAA Applications

Internal NOAA FY2016 Request for Proposals from the NOAA UAS Program Office within the Office of Oceanic and Atmospheric Research

Overview

The NOAA Unmanned Aircraft Systems (UAS) Program, in partnership with the Office of Aviation and Marine Operations (OMAO) and the Unmanned Systems (UxS) Steering Committee, is releasing a FY2016 Request for Proposals (RFP) to solicit NOAA Line Office assistance in the evaluation of UAS observing strategies. The UxS Steering Committee has identified eight priority needs for Agency UAS evaluation studies and other activities starting in FY2016. These eight priorities have been endorsed by the NOAA Observing System Council and are listed in Appendix A. Six of these eight priority needs are evaluation studies that match the objectives of this RFP.

The overall goal of the RFP across all of its objectives will be to identify UAS observing strategies or technologies that can be developed, tested and matured for transition into NOAA operations by one or more Line Offices. *A UAS observing strategy is simply how a Line Office will use UAS observations to meet its mission.* Based on observing requirements, the basic elements of a UAS observing strategy include:

- platform selection,
- payload selection,
- a concept of operations,
- information management plan,
- life-cycle management plan and
- staffing, safety, training and proficiency plans.

Evaluation studies proposed for this RFP could address any or all of these elements to advance the technology readiness of UAS observations for Line Office operations or routine applications.

How these observing strategy elements are implemented operationally depends upon the functions of the Line Office. Some Line Offices need to build internal NOAA expertise in UAS operations requiring specific planning for each observing strategy element. Other Line Offices may choose to contract UAS services or “data buys” from private industry vendors who have already addressed the observing strategy elements. The objectives of this RFP could be accomplished through a variety of approaches.

Background

The NOAA UAS Program within the NOAA Office of Oceanic and Atmospheric Research assists with the research, development, demonstration, evaluation, and transition to application of selected UAS observing strategies that can provide significantly improved or more efficient observing capabilities or safer observing operations for the NOAA observing system. Historically, the NOAA UAS Program has focused on high impact weather, marine, and polar observations. Projects selected through this RFP will still be tracked in these categories, but are also asked to concentrate on a specific set of platform, payload, and science data gaps recommended by the UxS Steering Committee.

The NOAA Office of Marine and Aviation Operations (OMAO) is a partner in this RFP and will oversee the development of safe UAS operations for NOAA. Proposers shall consult with the OMAO Aircraft Operations Center (AOC) during proposal preparation to discuss safety and operational feasibility of the proposed UAS observing strategy. After this discussion, AOC will provide a feasibility assessment to be included in the proposal package. The feasibility assessment will be a brief statement stating the likelihood that the proposal can be approved by the Federal Aviation Administration (FAA) in the current regulatory environment. Additionally, the OMAO AOC can support awarded proposals by submitting requests for flight authorization to the Federal Aviation Administration and providing licensed pilots, engineers and technicians. The AOC UAS Section email is aoc.uas.office@noaa.gov

Scope of the RFP

The NOAA UAS Program requests proposals from Line Office civil servants to lead projects addressing one or more of the following RFP objectives for evaluation studies. Each proposal should clearly describe how the evaluation study will advance the overall technology readiness level (TRL) of a UAS observing strategy. In general, advancement of technology readiness requires testing in relevant or operational environments. (See TRL definitions in Appendix B). Successful transition projects will ultimately optimize the balance between the positive impact of UAS observations to serve the NOAA mission and the cost effectiveness and operational feasibility of UAS operations.

During the development of an observing strategy, the platform, payload, and component systems may each begin at different TRLs. The total observing system will not be able to achieve TRL 8 until all system components have been successfully tested in a robust operational environment. The UAS observing strategy will not be able to achieve operational status (TRL 9) until:

1. all the elements of the observing strategy (i.e. platform selection, payload selection, concept of operations, information management plan, life-cycle

management plan and staffing, safety, training and proficiency plans) are tested and finalized AND

2. the Line Office is prepared to assume financial and administrative ownership of the observing strategy.

Proposals should clearly describe why UAS observations are needed by the Line Office and how conducting one or more of the evaluation studies described below will prepare the Line Office to begin using UAS observations operationally. The period of performance for selected projects will be no more than two years. Proposed projects are expected to advance by a minimum of one TRL per year. Proposed projects expected to reach operational status (TRL 9) with Line Office acceptance by the end of the period of performance are strongly encouraged.

Proposers are also strongly encouraged to consider how a proposed UAS observing strategy and/or UAS or instrument technology could be used beyond a single Line Office for wider NOAA benefit. Proposals with cross-Line Office teaming and cost sharing will receive favorable consideration during the proposal evaluation.

Description of RFP Objectives

The RFP objectives described below are not in ranked order of priority.

- **Evaluate options for high-resolution geo-referenced imagery (video and stills), ortho-photography, real time and post-processed for small and mid-size fixed/rotary wing UAS.**

NOAA seeks to accelerate the use of UAS for producing high-resolution geo-referenced imagery, ortho-photography from fixed wing or multi-rotor UAS. Systems that can respond rapidly to dynamic situations and provide 'easy to use' mission planning and data processing software and graphical user interfaces (such as a tablet application) are encouraged. Rapid mission planning, real time imagery collection, and the ability to quickly post process data in the field are all desirable capabilities. The UAS industry has experience a large increase in UAS mapping technologies and applications. It is expected that NOAA will use UAS designed for mapping applications to meet data gathering requirements in the future.

- **Evaluate options for gimbaled video data collection from small and mid-size fixed/rotary wing UAS.**

NOAA seeks to accelerate the use of UAS to provide real time video and still images to a remote control station. Small fixed wing and multi-rotor UAS that use gimbal video cameras will meet a variety of needs. The ability to provide real time imagery during flight to decision makers is a priority for this application.

- **Evaluate options for multi-mission/multi payload rotary wing capability (including all-environmental and ship/land based launched options).**

NOAA seeks to accelerate the use of fixed wing and multi-rotor UAS that have straightforward, multi-mission and multi-payload capabilities and can quickly be outfitted with a variety of science sensors depending on the science requirements. These multi-mission, multi-payload UAS may be reconfigured to meet specific science research objectives or routine observations. UAS that have some onboard data collection systems, common data busses and formats, reconfigurable physical payload infrastructure, and the ability of the UAS to fly multiple sensors and a variety of sensors (sequentially if not simultaneously) will provide NOAA the ability to use the same UAS to collect a variety of data types. These systems may need to be all-environment and have both land and ship launch capabilities. The proposal should address how NOAA will continue to utilize a multi-mission UAS capability.

- **Evaluate options for small to mid-size platforms to launch and recover from vessels including visual range and beyond line of sight UAS operations for all types of vessels.**

NOAA seeks to evaluate the options for small to mid-sized UAS that can be launched and recovered from vessels. NOAA's ship fleet operates worldwide and provides the opportunity for UAS to become significant force multipliers for NOAA when launched and recovered from NOAA's fleet. UAS that can fly both within visual range and beyond line of sight from all types of NOAA vessels are of interest. Proposals for ship launched UAS may include flight demonstrations for systems that can be flown from the majority of NOAA's ships. Evaluation of shipboard operations is the primary goal; collection of mission-critical data is a secondary goal, but the payload capability of UAS proposed for support should be sufficient to lead to a strong business case for NOAA adoption over the next 3-5 years.

- **Evaluate and explore business case for expendable UAS launched into hurricanes.**

Expendable UAS that can be launched from NOAA Aircraft, such as the WP-3D will provide force-multiplier capability for NOAA airborne observations in tropical storms.

Proposal to increase the technical readiness of expendable UAS should evaluate and explore business case for expendable UAS to launch in hurricanes.

- **Evaluate options for UAS profiles of the lower atmosphere with applications for severe weather.**

Evaluate UAS that can be used to improve understanding, forecasting, and damage assessments of severe weather in a rapid response mode. UAS observations of atmospheric profiles of the lower atmosphere using miniaturized airborne sensor suites are encouraged.

Proposal Submission Requirements

- This RFP is an internal NOAA competition. The Principal Investigator of the proposal must be a NOAA Line Office civil servant. Co-Investigators may be Federal employees, private industry personnel, Cooperative Institute partners or other academic personnel. Proposal teams are strongly encouraged to include a representative from the Line Office expected to operationally implement the UAS observing strategy.
- Questions regarding this RFP may be sent to uas.oar@noaa.gov. Responses to all questions will be posted to Goggle Drive link [noaa-uas-proposal-2016](#).
- The responsibility to transfer award funding to external NOAA partners belongs to the Principal Investigator. This risk should be discussed in the risk mitigation section.
- The responsibility to ensure procurement, contract, and grant actions do not adversely impact the project schedule belongs to the Principal Investigator. This risk should be discussed in the risk mitigation section.
- Each Line Office may submit up to four proposals to this RFP. Each Line Office may submit an additional fifth proposal if it involves a substantive partnership with another Line Office. All proposals should be coordinated with the Line Office UxS Steering Committee member, the Line Office Transition Manager, and Line Office leadership before submission.
- Proposals should be no more than 10 pages long excluding the title page, budget breakdown section, and letters of commitment. Proposals should be submitted electronically in Adobe Acrobat PDF format with 12-point font, single spacing, and 1 inch margins. Proposals not meeting these requirements will be returned without review.
- Proposals should be emailed to uas.oar@noaa.gov by 11:59 pm Pacific on February 24, 2016. The subject line of the email should begin with "FY2016 UAS RFP Submission." Proposals arriving after the deadline will be returned without review.

- Salary and overhead for NOAA employees will not be funded through this solicitation.
- Ship-time and manned aircraft flight hours will not be funded through this solicitation.
- Line Office cost sharing for UAS platform and payload procurements are very strongly encouraged. The anticipated ownership of procured equipment after the end of the project performance period should be clearly defined in the proposal.

Required Proposal Content

Title Page – Should list the project title, principal investigator and affiliation, co-investigators and affiliation, proposed period of performance, and proposed total budget (*This page is not included in the total page count*)

Concept of Operations (CONOPS) Feasibility Assessment – Provide a feasibility assessment signed by an AOC staff member. This assessment is a brief statement stating the likelihood that the proposal can be approved by the FAA in the current regulatory environment. (*This page is not included in the total page count*)

Project Abstract - Describe the project plan in no more than 500 words. The project abstract should include: (a) statement of which RFP objectives are being evaluated; (b) brief description of the proposed work; (c) brief statement describing how the proposed evaluation will advance the technology readiness of a proposed UAS observing strategy; (d) brief statement of how the proposed UAS observing strategy will relate to Line Office mission.

Project Scope – Provide a statement of work that describes which RFP objective is addressed by the proposed project and the overall scope of the evaluation study. Briefly describe the key milestones to be accomplished in the course of the evaluation study and the success criteria associated with each milestone.

Expected Significance – Describe the expected significance of the project to assist a Line Office to meet its mission. A description of the science traceability from the Agency Priorities to the Line Office mission goals to Line Office observing requirements to UAS observing capabilities is strongly encouraged. Explain how the Line Office will improve operations or other routine applications of UAS based on the results of the evaluation study.

Technical Project Plan – Provide a detailed description of the work that will be performed, how information will be collected, analyzed, and reported, and how technology readiness will be demonstrated, tested, or assessed. Evaluation studies

could include technical capabilities assessments, business case analysis, cost effectiveness and operational feasibility appraisals, training plans, life-cycle management projections, field demonstrations, and data plans. A research to operations transition plan, due at the project's conclusion, is a recommended deliverable for projects that are expected to advance to operational implementation. This transition plan should be coordinated with the Line Office Transition Manager before delivery. For proposals conducting field demonstrations, the proposed concept of operations (CONOPS) plan should be discussed including where, how and when the UAS will be flown and the total number of flight hours needed to accomplish the project goals.

Management Plan – Describe the management structure of the project for overall project coordination, decision-making, communication, and reporting. Include description of expected procurements, airspace access and clearances, travel, and shipping needs. Include a schedule chart that identifies critical milestones and expected deliverables.

Deliverables – Provide a description of expected project deliverables. Minimum deliverables will include a written project plan before funds are released, quarterly project status quad charts, annual progress report, and a final project report at the end of the performance period. A research to operations transition plan due at the project's conclusion is a recommended deliverable for a project that is expected to advance technology to operations.

Key Personnel – Describe key personnel needed to accomplish the project goals including level of effort, organizational affiliation, and project role for each person in the personnel list. Briefly describe qualifications of key personnel.

Comparative Technology Assessment– Describe the anticipated advantages of the UAS technology compared to current observing capabilities - e.g., reduction of size, mass, power, volume or cost, improved performance, or enabling new observing capabilities. Explain why UAS observations are expected to be beneficial over other observing technologies such as manned aircraft, satellites or surface-based networks. Describe how the platform and payload selections were made for the proposed UAS observing strategy and how these selections relate to comparative UAS technology. Describe the state of maturity of the UAS technology proposed and how the proposal will evaluate and advance the operational readiness of technology, operations, and personnel expertise. Identify the technical maturity at the beginning of the project and the expected technical maturity at the conclusion of the project (e.g., using the TRL categories defined in Appendix B).

Project Risk Mitigation – Describe the major risks to the project success and how they could be mitigated. For each risk, provide a description of how likely the risk could be (high, moderate, and low), the potential impact to the project (great, moderate, and

little), and what steps could be taken to mitigate the risk. Examples of risk may be procured equipment delivered behind schedule, key personnel leaving the project during the period of performance, cost overruns or platform failure during field testing.

Budget Breakdown – Provide a budget breakdown for each year for all major project expenses including personnel, platform flight hours, sensors, other hardware, shipping, travel, and data management. The budget breakdown should be prepared using the standard NOAA object classes. *(These pages are not included in the total page count.)*

Letter of Commitment – Provide a signed letter of commitment or other indication of endorsement from the UxS Steering Committee Member or Members submitting the proposal to the UAS Program Office. This letter should verify the commitment by the Line Office’s leadership to the project scope, management plan, schedule, budget, and deliverables of the proposed activities. For projects that are expected to advance to operational implementation, the letter should also verify the Line Office’s intent to deliver a research to operations transition plan. *(This letter is not included in the total page count)*

Funding Availability

Total funding provided by the NOAA UAS Program for this RFP is approximately \$1M subject to FY2016 appropriations. The total number of projects selected is anticipated to be about seven, but this number may vary depending on the total budget of highly rated proposals. A proposal budget can be as small or as large as needed as long as the total budget does not exceed \$1M. Additionally, a winning proposal may not be selected for each RFP objective depending on the quality of proposals submitted for other objectives.

Review Process and Evaluation Criteria

The deadlines for proposal submission and review are listed in Appendix C. A pool of expert reviewers will be compiled based on recommendations by the Line Office UxS Steering Committee members and external subject matter experts selected by the UAS Program Director. Each proposal will receive three written reviews. Next, the written reviews will be forwarded to a second panel of subject matter experts who will analyze the results of the written reviews and rank the proposals. The panel will be chaired by the UAS Program Director and will consist of one member plus a backup per Line Office recommended by the UxS Steering Committee and two to three reviewers selected by the NOAA UAS Program Director. Proposal rankings provided by panel review will be presented to the UxS Steering Committee for recommendations. The final proposal rankings recommended by the UAS Program Director and the UxS Steering Committee

will be presented to the OAR Deputy Assistant Administrator for Programs who will make the final proposal selection. All reviewers will sign non-disclosure forms before the review process starts. Reviewers will only be asked to review proposals which do not pose any potential conflicts of interest.

Proposals will be evaluated based on the following criteria:

1. Technical/scientific merit based on Project Scope and Technical Project Plan sections of the proposal (35 percent)
2. Importance and/or Relevance and applicability to NOAA mission based on Expected Significance section of the proposal: (20 percent)
3. Potential for successful transition to applications based on the Comparative Technology Assessment section of the proposal. (20 percent)
4. Feasibility of project costs and schedule based on the OMAO CONOPS Feasibility Assessment, Management Plan, Budget Breakdown, Project Risk Mitigation, and Deliverables sections of the proposal (15 percent)
5. Overall qualifications of applicant based on the Management Plan and Key Personnel sections of the proposal (5 percent)
6. Likelihood that FY16 flights can be conducted and initial findings provided based on the Technical Project Plan and Deliverables sections of the proposal (5 percent)

Appendix A

Eight UxS Steering Committee Recommendations for Agency Priority Needs for UAS Evaluation Studies and Other Activities Starting in FY2016.

1. Evaluate options for high-resolution geo-referenced imagery (video and stills), ortho-photography, real time and post-processed for small and mid-size fixed/rotary wing UAS.
2. Evaluate options for gimbal video for small and mid-size fixed/rotary wing UAS.
3. Deliver the preliminary business case for Global Hawk FY2016Q1. Continue testing of Global Hawk for NOAA requirements. (partner: NASA)
4. Evaluate options for multi-mission/multi payload rotary wing capability (include all-environmental and ship/land based launched options).
5. Evaluate options for small to mid-size platforms to launch and recover from vessels. Includes visual range and beyond line of sight UAS and all types of vessels. (partner: USCG)
6. Evaluate and explore business case for expendable UAS to launch in hurricanes.
7. Evaluate options for UAS profiles of the lower atmosphere with applications for severe weather.
8. Improved approaches to share information about successful applications and share lessons learned across the agency. This could include: internal NOAA UAS Science symposium, workshops, training programs.

Appendix B

Definitions of Technology Readiness Levels (TRL)

Transition Index	Technology Readiness Level	Description
Research	TRL 1	Basic or fundamental research
Research	TRL 2	Technology concept and/or application
Development	TRL 3	Proof-of-concept
Development	TRL 4	Concept validated in laboratory
Development	TRL 5	Concept validated in relevant environment
Demonstration	TRL 6	Prototype demonstration in relevant environment
Demonstration	TRL 7	Prototype demonstration in operational environment
Demonstration	TRL 8	System demonstration in an operational environment
Application	TRL 9	System totally operational

Appendix C

Table of RFP Deadlines

Date	Action
January 13, 2015	Release of RFP to Line Offices through UxS Steering Committee members
February 24, 2016	Full proposals due to UAS Program Office by 11:59 pm Pacific (limited to four proposals per Line Office selected by Line Office management)
February 26, 2016	Proposals distributed to reviewers (Three reviewers per proposal)
March 21, 2016	Written reviews due to UAS Program Office by close of business
March 23, 2016	Panel discussion of written reviews and ranking of proposals (Panel will include one panel member and a backup per Line Office recommended by the UxS Steering Committee members plus two to three external panel members selected by the UAS Program Director.)
March 29, 2016	Proposal rankings presented to UxS Steering Committee for recommendations and selection by the OAR DAA for Laboratories and Cooperative
March 31, 2016	Decision letters and copies of the written reviews will be delivered to proposal teams